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# CONSERVATION OF AMARAT ALI FAKHRO'S STOREHOUSE, MUHARRAQ, BAHRAIN – A CASE STUDY

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**Abstract:** The kingdom of Bahrain is an archipelago of 33 Islands located in the Arabian Gulf. The island covers 770 square kilometres of land which is connected to the kingdom of Saudi Arabia to the west through the king Fahd Causeway. In Arabic the word Bahrain is a dual form of bahar; it means sea. The name is derived from the topography of the island, as it is surrounded by two kinds of water, sweetwater springs and salty water. This island has started to build its architectural identity in the last 200 years. This paper focuses on the conservation, renovation and rehabilitation of the Amarat Ali Fakhro-I storehouse located in Muharraq, Bahrain. This storehouse devours distinguished architectural elements which are constructed using locally available traditional building materials. This paper throws a light on the structural conservation techniques used on the conservation and renovation of Amarat's storehouse.

**Index Terms** – Conservation, Heritage buildings, Bahrain, Structural conservation.

## I. INTRODUCTION

Conservation effort is of interest to professional conservators along with decision makers, donors, scholars and interested intelligentsia to protect and preserve a structure, monument or a site. Any conservation action has to be based on research, basic understanding of a structure and its significance, physical condition of a structure, financial availability, craftsmen with building craft skills, report on the existing state of the monument etc. Hence, to begin conservation on any heritage structure, the basic understanding of the structure and building materials, cultural and physical environment are necessary. The building structures in and around Bahrain were constantly damaged for the past few decades due to lack of maintenance, natural disasters, water percolation, capillary rise etc. These problems of the traditional buildings in the kingdom of Bahrain occurred in the majority of the structures. One of the structures is the storage house of Amarat Ali Fakhro; a renowned boat and timber trader. The structural conservation of the Amarat Ali Fakhro-I was undertaken by Almoayyed Interiors with the cooperation of Bahrain Authority of Culture and Antiquities. Studio Anne Holtrop consulted the entire project with their world-class standards and techniques. The conservation works included the preparation of drawings, conservation guidelines, structural conservation, restoration of selective parts etc.

For this study secondary data has been collected. From the website of KSE the monthly stock prices for the sample firms are obtained from Jan 2010 to Dec 2014. And from the website of SBP the data for the macroeconomic variables are collected for the period of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

## II. Site Location And Values

This heritage house is located in Muharraq city; the third largest city in Bahrain. A number of historical commercial buildings situated in Muharraq traditional markets are part of this heritage city and narrative. It is the only historic town existing in the south side of the Gulf since others have been largely demolished. A group of three 'Amarat of the Fakhro family' originally a boat and timber trader family is found immediately to the west of the Siyadi Shops in Muharraq city. Of these three, the two northern 'Amarat' were initially owned by Ali Rashid Fakhro. Amarat Ali Rashid Fakhro (I) is a shop and storehouse complex operated by the Fakhro family from the 1890s in Bahrain (Gaetano, 2012). This heritage building still houses one of Muharraq's longest continuously operating coffee shops, the 'Qahwat Bu Khalaf,' an important social institution in the market precinct during the pearling era.

## III. Architectural features and elements

The Amarat Ali Fakhro's storehouse is rich in its traditional architectural elements ranging from two massive doors, one on each end; providing equal access to the market and the seashore. At some places, the wooden door is topped by a decorative arch, arched-window with a wooden ceiling. The storehouse is built in a typical Bahraini traditional style. The method of construction was a basic frame of stone piers and timber beams. The piers and the beam created rectangular voids which are decorated with windows, doors, ventilators, paving stones and walls. The walls and piers are constructed using coral stones of different shapes and sizes. A mixture is made using sand, gypsum and water in a specific ratio which was applied as binding agent after each layer of stone masonry (Yarwood, 1999). The stones are arranged in a systematic manner using bigger stones on the external side of the wall followed by smaller stones and gravels to fill in the gaps.

Following the wall, 1 metre above ground level, a layer of round timber beam is made all around the perimeter of the structure. After this, the beams are wrapped with 1 cm thick round ropes diagonally to strengthen the bond with mortar. The gaps between timber beams and wall are filled with stone and gypsum mixture mortar. This timber layer is also repeated over the window and door top. Timber wooden beams (danchel) of 10 cm diameter were spanned wall to wall forming the main structure of the roof. A layer of thin bamboo sticks was applied over the beans diagonally covered by netted bamboo sheets (mangrof), and then topped with a layer of mud.

## IV. Condition of the Storehouse before Conservation

The storehouse was occupied by foreign, low income labourers who neglected in dealing with the house's physical features or in adding extra structures when there was a need for extra spaces. These additional structures were added using modern materials-cement and blocks, hence, they were not in harmony with the architecture, and also without any respect for the authenticity and values of the building. In addition to the fact that the storehouse didn't face any level of maintenance for a number of years. The condition of the wooden doors, windows, stained glasses were not maintained properly nor renovated ever. Due to the capillary actions of salt water, the plastering of walls and several parts of the structure was damaged (Fig.1). The ceiling and danchel were filled with dust and dirt which gave an ugly look on the interiors. The floors and walls had cracks in several areas. There were deep cracks in the joints between the traditional walls and the added cement walls.

## V. Structural Conservation of the Storehouse

A strategy was implemented to keep up the architectural traditional fabric of the structure while conserving its cultural and architectural values in order to reuse it. First the storehouse was evacuated of people, furniture and all other added physical features such as water and heater tanks. Then a full documentation of the house was done including plans, elevations, room sections, architectural elements, all by drawings and pictures. After that a survey to evaluate the structural situation and the infrastructure services of the house took place. Tests were done in different places of the house and including all the structural elements: foundation, columns, roofs, walls and staircase (Sirriyeh, 2005).

Following this, the damaged and superficial cement and gypsum plasters were mechanically removed (Fig.2). The damaged areas like pillars, walls, beams and other deeply damaged spots were filled with pavement stones and consolidated by adding hydraulic lime mortar. A layer of plaster using 'ROFIX plaster material' was added as per the guidelines. After this the old plaster will reach the required level for cleaning, on which ethyl silicate is used to stabilise the final state of the old plaster (Fig.3) (Yarwood, 1999).

The structure was then cleaned by a dry cleaning method to remove the inconsistent and incompatible surface materials. Vacuums, soft and metallic brushes, chisels, scalpels, spatulas etc were used in the dry cleaning process of the structure (Gupta, 2004).

After the dry cleaning process, careful cleaning of the wall using a steam machine combined with soft brushes is made to remove the hard dirt. The working parameters include the working distance, pressure, temperature and duration which will be recorded for all the cleaning process. In some selected areas, a steam cleaning method cannot be implied; instead a layer of Ethyl alcohol is applied and wiped off with a sponge to remove the dirt (Gupta, 2004).

All the wooden elements of the structure were first dry cleaned by using soft brush and a vacuum cleaner. Then chemical cleaning is done using rectified spirit and ethanol. The paint layer on wood is removed by using SM-10(paint remover) as suggested by the conservation guidelines (Nanda, 2017). After cleaning the wooden elements, a layer of protection is applied using a hot mixture of teak oil and turpentine in 1:3 ratios (Fig.4).

The rusting on the Iron bars is cleaned by using rectified spirit or SM-10. After cleaning the iron bar, a layer of Ethanol and burnt tanina powder (Tannin seed) is applied for the protection. Then, a mixture of 1% paraloid B72 in Sulphur free Toluene is applied as a protective coating which gives a glossy effect (Sirriyeh, 2005).

**Fig.1. Damaged wall before conservation**

**Fig.2. Removing of pre-existing plaster.**

**Fig.3. Application of plaster in damaged areas.**

**Fig.4. After the structural conservation of the walls.**

**Fig.5. Final view of the structure after conservation.**

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